REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(LEAVE BLANK)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	25 March 1999	Abstract

4. TITLE AND SUBTITLE

Effects of Physiologic Heat Stress on Cognitive Performance during Simulated Flight Tasks

5. FUNDING NUMBERS

6. AUTHOR(S)

Barry Shender Gregory Askew Jonathan Kaufman
Linda Schaaf

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Naval Air Warfare Center Aircraft Division
22347 Cedar Point Road, Unit #6
Patuxent River, Maryland 20670-1161

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Naval Air Systems Command
47123 Buse Road, Unit IPT
Patuxent River, Maryland 20670-1547

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

It is known that heat stress leads to reduced +Gz-tolerance in tactical aircrew. The first phase of an effort to determine the relationship between physiologic heat stress and flight performance was conducted using the new NAWCADPAX flight simulator installed in an environmental chamber.

Performance scores declined after subjects were exposed to the hot alert conditions relative to control, though the difference was not statistically significant. Correlation analysis indicated a marginal relationship between the change in performance and rectal and mean skin temperatures (r=0.59 and 0.55, respectively).

The experimental design did not account for the increased generation of metabolic heat associated with straining against high G forces, though it did include radiant heat loads. The next phase will include physical work in the cockpit to account for this additional factor.

14. SUBJECT TERMS

Physiologic heat stress flight performance +Gz

15. NUMBER OF PAGES

1

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

EFFECTS OF PHYSIOLOGIC HEAT STRESS ON COGNITIVE PERFORMANCE DURING SIMULATED FLIGHT TASKS

BS Shender*, G. Askew, J., Kaufman*, L. Schaaf. NAWCAD, Patuxent River, MD

INTRODUCTION: It is known that heat stress leads to reduced +Gz-tolerance in tactical aircrew. The first phase of an effort to determine the relationship between physiologic heat stress and flight performance was conducted using the new NAWCADPAX flight simulator installed in an environmental chamber. METHODS: 8 male volunteers (32.4 ± 8.5 yr, 79.6 ± 10.8 kg) wearing full Combat Edge equipment, enhanced coverage anti-G suit, survival vest, and torso harness participated. The environmental conditions during an ALERT scenario were simulated including pre- and post flight brief, pre- and post flight aircraft inspection, alert, and 90 min flight. Ambient conditions were: brief: Tdb = 22°C, 45% RH; aircraft inspection and alert: Tdb = 44°C, Tbg = 49°C, 40% RH; flight: Tdb = 27°C, Tbg = 37°C, 40% RH. Data were collected during two separate days under these conditions and a single control day with chamber conditions at Tdb = 27°C, Tbg = 37°C, 40% RH. During inspections, subjects exercised on a bicycle ergonometer at 40% of their VO2max. Rectal and skin temperatures (10 sites), heat flux (7 sites), and ECG were monitored. Subjects flew three different tail chase scenarios which were generated using a highly textured video graphical display and an F-18 aeromodel. Flight information was displayed on a HUD and subjects flew with a control stick and throttle. Scenarios included low (constant azimuth, varying altitude), medium (constant altitude high +Gz turns), and high workloads (varying altitude and turns). Flight performance was determined by comparison to the target aircraft. RESULTS: Performance scores declined after subjects were exposed to the hot alert conditions relative to control, though the difference was not statistically significant. Correlation analysis indicated a marginal relationship between the change in performance and rectal and mean skin temperatures ($r=0.59$ and 0.55, respectively). CONCLUSIONS: The experimental design did not account for the increased generation of metabolic heat associated with straining against high G forces, though it did include radiant heat loads. The next phase will include physical work in the cockpit to account for this additional factor.